Hanford's Groundwater Protection Program

Prevent Degradation:

- Remediate high-risk waste sites
- Shrink the contaminated areas
- Reduce natural and artificial recharge

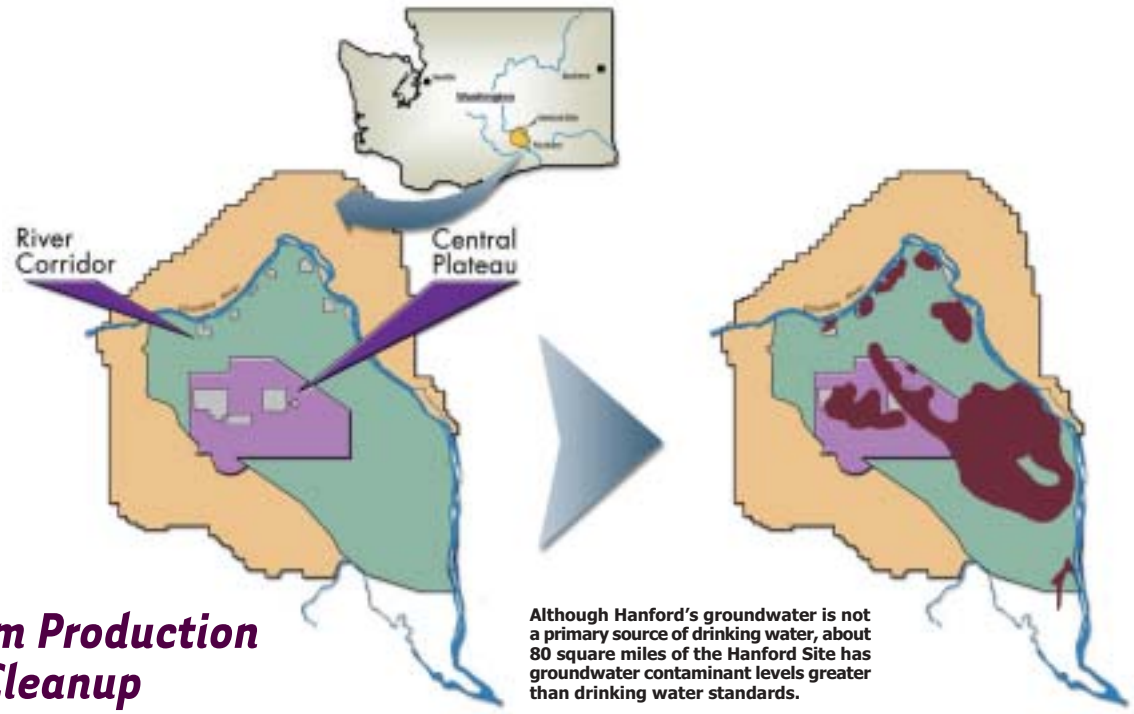
Remediate Groundwater:

- Implement final groundwater remedies

Monitor Groundwater:

- Integrate groundwater monitoring needs

People working together to accelerate cleanup



Although Hanford's groundwater is not a primary source of drinking water, about 80 square miles of the Hanford Site has groundwater contaminant levels greater than drinking water standards.

From Production to Cleanup

Fifty years of nuclear weapons production resulted in approximately 1.7 trillion liters (450 billion gallons) of liquid waste being released to the ground at the Hanford Site. Much of the contamination remains in the vadose zone, between the top of the water table and the surface of the ground, but some has reached groundwater.

In general, groundwater is the supply of fresh water found in layers beneath the earth's surface. Currently about 80 square miles or about 14% of the Hanford Site has groundwater contaminant levels greater than drinking water standards.

Although Hanford groundwater is not a primary source of drinking water and does not impact the overall water quality of the Columbia River, it does flow into the Columbia River—which is a major drinking water source and could experience impacts from contamination at specific river shore locations.

Early in 2002, the U.S. Department of Energy, the U.S. Environmental Protection Agency, and the Washington State Department of Ecology developed the *Hanford Performance Management Plan for the Accelerated Cleanup of the Hanford Site*. Later that same year, the Fluor Hanford-managed Groundwater Protection Program was established to champion Initiative 6 of the plan—"Accelerate Groundwater Cleanup and Protection."

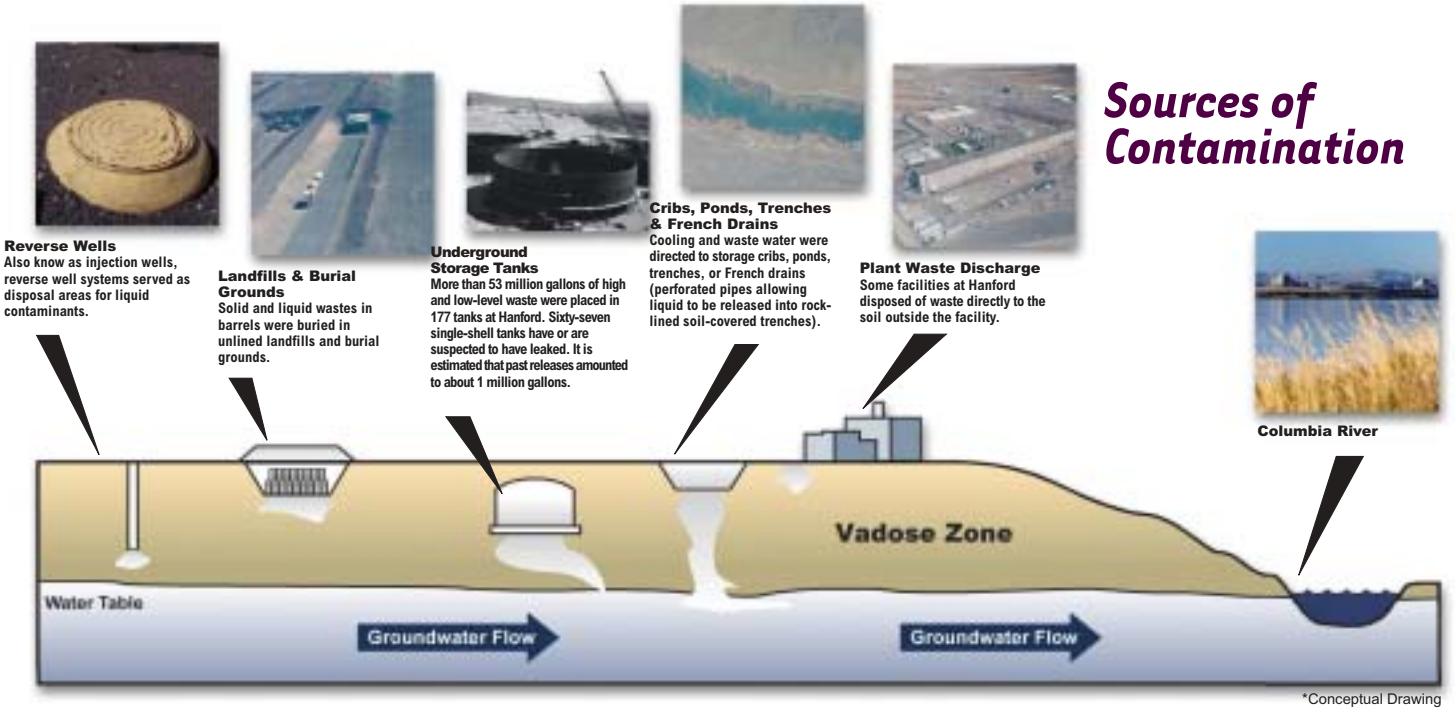
In the first few months of 2003, the Groundwater Protection Program completed a plan of action for accelerating groundwater cleanup and protection. A link to *Hanford's Groundwater Management Plan: Accelerated Cleanup and Protection* can be found on the program's Internet home page, http://www.hanford.gov/cp/gpp/. The plan focuses on three primary goals—aggressively cleaning up groundwater contaminants, avoiding future groundwater contamination, and preventing groundwater contaminants from migrating to the Columbia River. Attaining these goals will prevent further groundwater degradation and return groundwater to beneficial use, where possible.

In order to make informed, efficient accelerated cleanup decisions, the Groundwater Protection Program involves stakeholders early in the decision-making process. Rapid progress also means regularly interfacing with other Site contractors who share work scope with Fluor Hanford.

The Pacific Northwest National Laboratory identifies and addresses science and technology needs, provides modeling and assessments, and monitors most of Hanford's groundwater. Tank Farm Vadose Zone Project coordinator, CH2M HILL Hanford Group characterizes the vadose zone and monitors groundwater at the Hanford Tank Farms. S.M. Stoller, Incorporated performs geophysical well logging for the program.

The Challenge

Sources of Contamination



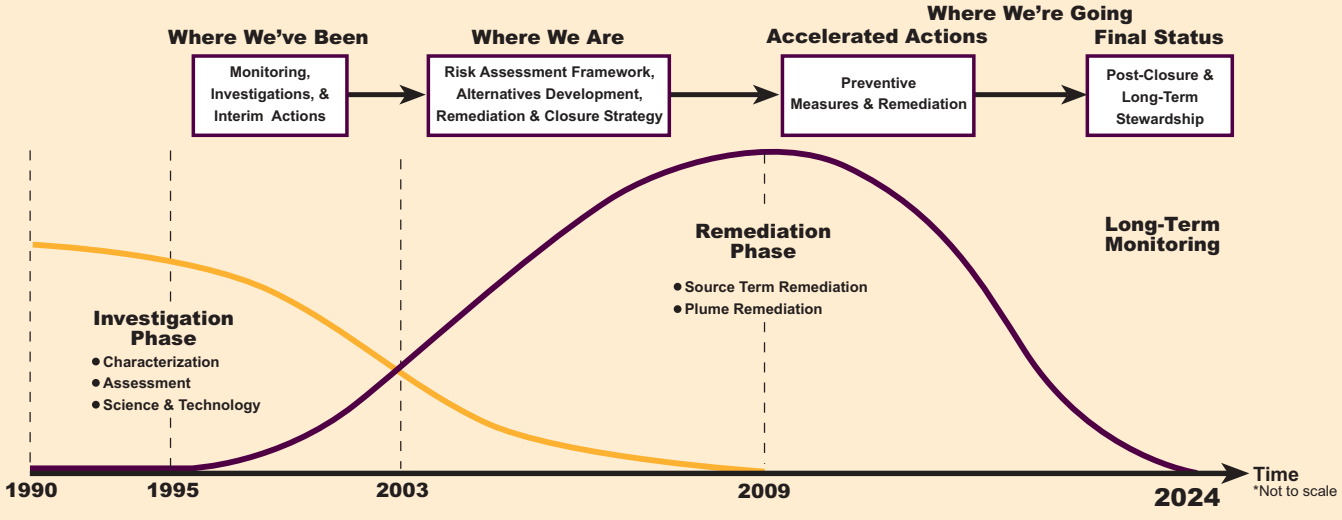
*Conceptual Drawing

Hazardous Chemical Contaminants

Carbon tetrachloride was used in plutonium processing in Hanford's 200 West Area. Although it has not been found in monitoring wells near the Columbia River, a 3.8 square-mile plume could reach the river in the future. Sodium dichromate was formerly used as a corrosion inhibitor in reactor cooling water. Today, chromium contaminates about one square mile of groundwater in Hanford's 100 Area. Although Hanford is not the main source of nitrate in the Columbia River, nitrate contaminates about 13.8 square miles of Hanford groundwater at concentrations above the drinking water standard.

Radioactive Contaminants

With a low drinking water standard and long half-life, groundwater-mobile iodine-129 contaminates about 30.6 square miles of Hanford groundwater but has not reached the Columbia River in concentrations above the drinking water standard. A product of fuel processing, strontium-90 contaminates about one square mile of Hanford groundwater—mostly beneath former plutonium production reactors. Uranium plumes, totaling about 0.6 square miles, are in Hanford's 200 West, 200 East, and 300 Areas. Technetium-99 contaminates about 0.9 square miles and is very mobile in Hanford groundwater. Tritium—the most mobile and widely distributed Hanford radionuclide—contaminates about 54.8 square miles of Hanford groundwater and has entered the Columbia River. *Plume sizes reflect values above drinking water standards



Meeting the Challenge

Preventing Degradation

Surface barriers, re-vegetation, and other early actions at high-risk waste sites near the Plutonium Finishing Plant, as well as cribs and trenches at U Plant, PUREX, and land south of the 200 East Area, may prevent or significantly reduce future impacts to groundwater. (Photo is of the *Hanford Surface Barrier* prototype.)

Proposed plans to shrink contaminated areas include:

- Removing, treating, and disposing of 200 North Area contaminated material in the Environmental Restoration Disposal Facility (shown below)
- Stabilizing surfaces at Gable Mountain Pond and B Pond with clean topsoil and re-vegetation, then monitoring natural decay
- Placing a surface barrier over the Non-radioactive Dangerous Waste Landfill, then monitoring it for natural decay

To reduce the risk of "recharging" contaminants (water pushing them further into the soil), Groundwater Protection is:

- Reducing infiltration at existing waste sites
- Decommissioning unused wells
- Capping, removing, shutting off, moving or repairing leaking water lines (shown below) and septic systems

Remediating Groundwater

Interim remedial actions have been instituted, while the Groundwater Protection Program works to put final remedial measures in place. A 2,230-foot *In-Situ Redox Manipulation* permeable barrier completed in 2003 (above left) is protecting the Columbia River by changing hexavalent chromium in a migrating underground plume to a less mobile, less toxic form of chromium. *Pump-and-treat systems* are treating subsurface plumes of hexavalent chromium in the 100 D, 100 H (above right), and 100 K Areas; strontium-90 in the 100 N Area; and carbon tetrachloride, uranium and technetium-99 in the 200 West Area.

Monitoring Groundwater

Routine groundwater monitoring performed by Fluor Hanford, the Pacific Northwest National Laboratory, and CH2M HILL Hanford Group allows scientists to chart the movement of groundwater contaminants and determine whether the groundwater is compliant with environmental protection requirements.

Visit the Groundwater Protection Program website at:

http://www.hanford.gov/cp/gpp/

GROUNDWATER PROTECTION PROGRAM

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